

Safety Instructions

Omnigrad TRxx, TCxx, TxCxxx

RTD/TC modular thermometers

OEx ia IIC T6...T1 Ga X

Ga/Gb Ex ia IIC T6...T1 Ga X

Ex ia IIIC 85 °C...450 °C Da X

Ex ia IIIC 85 °C...450 °C Da/Db X



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Safety instructions for electrical apparatus for explosion-hazardous areas →  3

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Table of contents

Supplementary Documentation	4
EAC certificate of conformity	4
Manufacturer address	4
Safety Instructions: General	4
Safety Instructions: Installation in equipment of Group III	6
Safety Instructions: Intrinsic safety	6
Safety Instructions: Zone 0	7
Safety Instructions: Special conditions	7
Safety Instructions: Partition wall	7
Temperature tables	7
Electrical connection data	10

Supplementary Documentation

The Explosion-protection brochure is available:
In the download area of the Endress+Hauser website:
www.endress.com -> Downloads -> "Brochures and catalogs" ->
Text Search: CP00021Z

EAC certificate of conformity

The RTD/TC inserts and cable thermometers meet the fundamental health and safety requirements for the design and construction of devices and protective systems intended for use in potentially explosive atmospheres in accordance with TR CU 012/2011.

Certification body: НАННО "ЦСВЭ"

Certificate number: EAЭС RU C-DE.AA87.B.00331/20

Affixing the certificate number certifies conformity with the following standards:

GOST 31610.0-2014 (IEC 60079-0)

GOST 31610.26-2012 (IEC 60079-26)

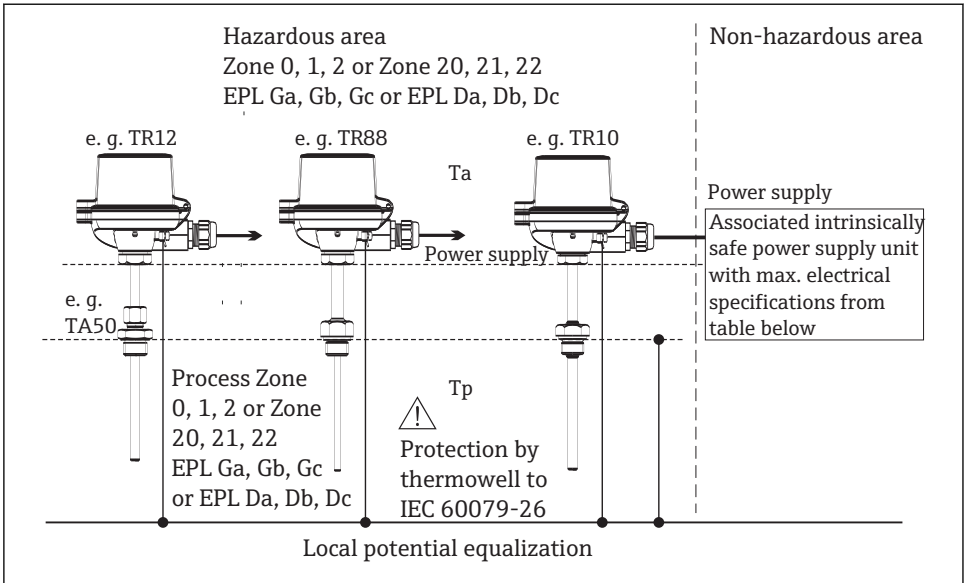
GOST 31610.11-2014 (IEC 60079-11)

Manufacturer address

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D-87484 Nesselwang
Germany
Phone: +49 (0)8361 308 0

**Safety Instructions:
General****Explosive atmosphere**

- ▶ In an explosive atmosphere, do not open the device when voltage is supplied (ensure that the IP67 housing protection is maintained during operation).



- Comply with the installation and safety instructions in the Operating Instructions.
- Install the device according to the manufacturer's instructions and any other valid standards and regulations (e.g. GOST 30852.13, IEC 60079-14).
- The housing of the thermometer must be connected to the local potential equalization or installed in a grounded metallic piping or tank respectively.
- It cannot be taken for granted that when using compression fittings (e.g. TA50, TA60, TA70) with non metallic olives that there is a secure grounding when installing in a metal system. This means that an additional safe connection to the local potential equalization needs to be used.
- For using of a plug-in connector (e.g. PA-connector by Weidmüller) is to be observed that the requirements for the respective category and the operating temperature are followed.

**Safety
Instructions:
Installation in
equipment of
Group III**

- Sensors for thermometers without thermowell (e.g. TX62, TR24, TX88) are to be mechanically protected by thermowell providing a degree of protection of at least IP5X and in compliance with the enclosure requirements to GOST 31610.0 (IEC 60079-0).
- Seal the cable entries tight with certified cable glands (min. IP6X) IP6X according to IEC 60529.
- The provided cable glands according to option code are suitable ATEX/IECEX Ex certified glands with a temperature range of -20 to +95 °C.
- For operating the thermometer at an ambient temperature under -20 °C, appropriate cables, cable entries and sealing facilities permitted for this application must be used.
- For ambient temperatures higher than +70 °C, use suitable heat-resisting cables or wires, cable entries and sealing facilities for Ta + 5 K above surrounding.
- For using of a plug-in connector (e.g. PA-connector by Weidmüller) is to be observed that the requirements for the respective category and the operating temperature are followed.
- The thermometer must be installed and maintained so, that even in the event of rare incidents, an ignition source due to impact or friction between the housing and iron/steel is excluded.

⚠ WARNING

Explosive atmosphere

- ▶ In an explosive atmosphere, do not open the device when voltage is supplied (ensure that at least IP6X is maintained during operation).

**Safety
Instructions:
Intrinsic safety**

- Comply with the installation and safety instructions in the Operating Instructions.
- Install the device according to the manufacturer's instructions and any other valid standards and regulations (e.g. GOST 30852.13, IEC 60079-14).
- Observe the safety instructions for the used transmitters.
- The display, type TID10, may only be installed in Zone 1 (EPL Gb) or Zone 2 (EPL Gc).
- The type of protection changes as follows when the devices are connected to certified intrinsically safe circuits of Category ib: Ex ib IIC.
- When connecting to an intrinsically safe ib circuit, do not operate the sensor at Zone 0 without any thermowell according to GOST 31610.26 (IEC 60079-26).

- When connecting dual sensors make sure that the potential equalizations are at the same local potential equalization.
- Inserts with 3 mm diameter or grounded inserts, e.g. type TPC100 must be connected to the local potential equalization.
- For inserts with 3 mm diameter or grounded inserts, e.g. type TPC100 an intrinsically safe supply with galvanic isolation must be used.

Safety

Instructions: Zone 0

- Only operate devices in potentially explosive vapour/air mixtures under atmospheric conditions:
 - $-40\text{ °C} \leq T_a \leq +130\text{ °C}$ (see table Ta housing)
 - $-0.8\text{ bar} \leq p \leq 1.1\text{ bar}$
- If no potentially explosive mixtures are present, or if additional protective measures have been taken, according to GOST EN 1127-1, the transmitters may be operated under other atmospheric conditions in accordance with the manufacturer's specifications.
- Associated apparatus with galvanic isolation between the intrinsically safe and non-intrinsically safe circuits are preferred.

Safety

Instructions: Special conditions

- The thermometer must be installed so, that even in the event of rare incidents, an ignition source due to impact or friction between the housing and iron/steel is excluded.
- Avoid electrostatic charging of the plastic surfaces of TA20B housing.
- Avoid electrostatic charging of the plastic housing (do not rub dry).

Safety

Instructions: Partition wall

Install the thermometer in a partition wall which is in compliance with GOST 31610.26 (IEC 60079-26) in reference to its ultimate application.

Temperature tables

The dependency of the ambient and process temperatures upon the temperature class for assembly with transmitters:

Type	Assembled transmitter	Temperature class	Ambient temperature range housing	Maximum surface temperature housing
TR1x, TC1x	TMT181 TMT182 TMT84/TMT85	T6	$-40\text{ °C} \leq T_a \leq +55\text{ °C}$	T85 °C
		T5	$-40\text{ °C} \leq T_a \leq +70\text{ °C}$	T100 °C
		T4	$-40\text{ °C} \leq T_a \leq +85\text{ °C}$	T135 °C
	TMT82	T6	$-40\text{ °C} \leq T_a \leq +58\text{ °C}$	T85 °C
		T5	$-40\text{ °C} \leq T_a \leq +75\text{ °C}$	T100 °C

Type	Assembled transmitter	Temperature class	Ambient temperature range housing	Maximum surface temperature housing
		T4	$-40\text{ °C} \leq T_a \leq +85\text{ °C}$	T135 °C
	TMT8x with display	T6	$-40\text{ °C} \leq T_a \leq +55\text{ °C}$	T85 °C
		T5	$-40\text{ °C} \leq T_a \leq +70\text{ °C}$	T100 °C
		T4	$-40\text{ °C} \leq T_a \leq +85\text{ °C}$	T135 °C

Type	Assembled transmitter	Insert diameter	Process temperature range	Temperature class/maximum surface temperature sensor
TR1x, TC1x	TMT18x TMT8x	3 mm 3 mm (dual) or 6 mm dual	$-50\text{ °C} \leq T_p \leq +66\text{ °C}$	T6/T85 °C
			$-50\text{ °C} \leq T_p \leq +81\text{ °C}$	T5/T100 °C
			$-50\text{ °C} \leq T_p \leq +116\text{ °C}$	T4/T135 °C
			$-50\text{ °C} \leq T_p \leq +181\text{ °C}$	T3/T200 °C
			$-50\text{ °C} \leq T_p \leq +276\text{ °C}$	T2/T300 °C
			$-50\text{ °C} \leq T_p \leq +426\text{ °C}$	T1/T450 °C
		6 mm	$-50\text{ °C} \leq T_p \leq +73\text{ °C}$	T6/T85 °C
			$-50\text{ °C} \leq T_p \leq +88\text{ °C}$	T5/T100 °C
			$-50\text{ °C} \leq T_p \leq +123\text{ °C}$	T4/T135 °C
			$-50\text{ °C} \leq T_p \leq +188\text{ °C}$	T3/T200 °C
			$-50\text{ °C} \leq T_p \leq +283\text{ °C}$	T2/T300 °C
			$-50\text{ °C} \leq T_p \leq +433\text{ °C}$	T1/T450 °C

The dependency of the ambient and process temperatures upon the temperature class for assembly without transmitter (terminal block or flying leads):

Insert diameter	Temperature class/ Maximum surface temperature	Tp (process) - maximum allowed process temperature (sensor)				
		Pi ≤ 50 mW	Pi ≤ 100 mW	Pi ≤ 200 mW	Pi ≤ 500 mW	Pi ≤ 650 mW
3 mm 3 mm (dual) or 6 mm dual	T1/T450 °C	+426 °C	+415 °C	+396 °C	+343 °C	+333 °C
	T2/T300 °C	+276 °C	+265 °C	+246 °C	+193 °C	+183 °C
	T3/T200 °C	+181 °C	+170 °C	+151 °C	+98 °C	+88 °C
	T4/T135 °C	+116 °C	+105 °C	+86 °C	+33 °C	+23 °C
	T5/T100 °C	+81 °C	+70 °C	+51 °C	-2 °C	-12 °C

Insert diameter	Temperature class/ Maximum surface temperature	Tp (process) - maximum allowed process temperature (sensor)				
		Pi ≤ 50 mW	Pi ≤ 100 mW	Pi ≤ 200 mW	Pi ≤ 500 mW	Pi ≤ 650 mW
	T6/T85 °C	+66 °C	+55 °C	+36 °C	-17 °C	-27 °C
6 mm	T1/T450 °C	+433 °C	+428 °C	+420 °C	+398 °C	+388 °C
	T2/T300 °C	+283 °C	+278 °C	+270 °C	+245 °C	+235 °C
	T3/T200 °C	+188 °C	+183 °C	+175 °C	+153 °C	+143 °C
	T4/T135 °C	+123 °C	+118 °C	+110 °C	+88 °C	+78 °C
	T5/T100 °C	+88 °C	+83 °C	+75 °C	+53 °C	+43 °C
	T6/T85 °C	+73 °C	+68 °C	+60 °C	+38 °C	+28 °C

Insert diameter	Temperature class/ Maximum surface temperature	Tp (process) - maximum allowed process temperature (sensor)			Ta (ambient) - ambient temperature (housing) ¹⁾
		Pi ≤ 50 mW	Pi ≤ 100 mW	Pi ≤ 200 mW	
6 mm dual	T1/T450 °C	+320 °C	+312 °C	+280 °C	-40 °C ≤ Ta ≤ +130 °C
	T2/T300 °C	+170 °C	+162 °C	+130 °C	
	T3/T200 °C	+75 °C	+62 °C	+30 °C	
	T4/T135 °C	+10 °C	+2 °C	-30 °C	-40 °C ≤ Ta ≤ +116 °C
	T5/T100 °C	-25 °C	-33 °C	-	-40 °C ≤ Ta ≤ +81 °C
	T6/T85 °C	-40 °C	-	-	-40 °C ≤ Ta ≤ +66 °C
6 mm	T1/T450 °C	+381 °C	+377 °C	+361 °C	-40 °C ≤ Ta ≤ +130 °C
	T2/T300 °C	+231 °C	+277 °C	+211 °C	
	T3/T200 °C	+136 °C	+127 °C	+111 °C	
	T4/T135 °C	+71 °C	+67 °C	+51 °C	-40 °C ≤ Ta ≤ +123 °C
	T5/T100 °C	+36 °C	+32 °C	+16 °C	-40 °C ≤ Ta ≤ +88 °C
	T6/T85 °C	+21 °C	+17 °C	+1 °C	-40 °C ≤ Ta ≤ +73 °C

1) When using TA20R or TA21E housing please observe the maximum allowed temperature per TI00254T.

Determination of process temperature for $P_i \leq 50$ mW:

Insert diameter	Thermal resistance (Rth) for 50 mW	Formula for calculating process temperature (Tp)
3 mm, 3 mm (dual) or 6 mm dual	274 K/W	$T_p < T_{class}^{1)} - Tolerance^{2)} - (R_{th} \times P_0^{3)})$
6 mm	144 K/W	

- 1) Inserting of temperature class, e.g. 85 °C (K) for T6
- 2) Inserting of Tolerances to IEC 60079-0 chapter 26.5.1.3: 5 K for T6, T5, T4 and T3, 10 K for T2 and T1
- 3) P_0 of intrinsic safe temperature input (e.g. measurement circuit TMT182, $P_0 = 6.6$ mW)

Calculation example for T6 and 6 mm insert:

$$T_p < T_{class} - Tol. - (R_{th} \times P_0)$$

$$T_p < 85 \text{ K} - 5 \text{ K} - (144 \text{ K/W} \times 6.6 \text{ mW})$$

$$T_p < 79.04 \text{ °C}$$

Electrical connection data

Associated intrinsically safe power supply unit with maximum electrical specifications below the characteristic values of the assembled transmitter:

Transmitter	Ui	Ii	Pi	Ci	Li
TMT181	30 V	100 mA	760 mW	0	0
TMT182			750 mW		
TMT82		130 mA	800 mW		
TMT84, TMT85	FISCO field device				
Terminal block	30 V	140 mA	1 000 mW	See tables below	
Flying leads	30 V	140 mA	1 000 mW	See tables below	

TS111/TPx100:

Sensor type	Insertion length IL		Flying leads		Terminal block	
	$C_i/F/m$	$L_i/H/m$	C_i/F	L_i/H	C_i/F	L_i/H
Single	$2.00 \cdot 10^{-10}$	$1.00 \cdot 10^{-06}$	$1.96 \cdot 10^{-11}$	$9.80 \cdot 10^{-08}$	$4.60 \cdot 10^{-12}$	$2.30 \cdot 10^{-08}$
Dual	$4.00 \cdot 10^{-10}$	$2.00 \cdot 10^{-06}$	$3.92 \cdot 10^{-11}$	$1.96 \cdot 10^{-07}$	$9.20 \cdot 10^{-12}$	$4.60 \cdot 10^{-08}$

Calculation formula for options with flying leads and terminal block only:

- $C_i = C_{i \text{ insertion length IL}} \times \text{IL} + C_{i \text{ flying leads}}$
 $L_i = L_{i \text{ insertion length IL}} \times \text{IL} + L_{i \text{ flying leads}}$
- $C_i = C_{i \text{ insertion length IL}} \times \text{IL} + C_{i \text{ terminal block}}$
 $L_i = L_{i \text{ insertion length IL}} \times \text{IL} + L_{i \text{ terminal block}}$

Type of protection	Type
OEx ia IIC T6...T1 Ga X	TR10, TR11, TR12, TR13, TR15, TR24, TR45, TR47, TR88
Ga/Gb Ex ia IIC T6...T1 Ga X	TR88
Ex ia IIIC 85 °C...450 °C Da X	TC10, TC12, TC13, TC15, TC88
Ex ia IIIC 85 °C...450 °C Da/Db X	TR61, TR62, TR63, TR65, TR66 TC61, TC62, TC63, TC65, TC66

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